"Adjustable modular support for modular staircases"

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DESCRIPTION

Modular staircases with modular elements, initially devised to ease interventions for renovation and alteration of old buildings, are now also adopted for new constructions in anticipation of a subsequent different use of the spaces and the possible need to modify the arrangement and configuration of the flights. Indeed, said modular staircases, formed from a plurality of identical intermediate elements placed between two terminal elements made so as to allow them to be firmly fastened one to the start floor and the other to the arrival floor, allow the straight or curvilinear progression of the flight and also the rise of the steps to be arranged during the assembly of the modular elements, which takes place by successively coupling them at vertical pivot axes on which each added element is to be oriented and spaced with respect to the last one already assembled.

For such a purpose modular elements currently in use have a horizontal flat portion which, arranged to allow the tread plane to be fastened on it through screws, is stably and rigidly connected to two vertical sleeves for the successive couplings.

However, in staircases formed with similar modular elements it is neither foreseen nor permitted to adjust the tread, which instead is indispensable to optimise the practicability of the staircase in relation to the rise of the stairs. Indeed, the first rule in designing a staircase is that of respecting the optimal relationship between rise (a) and tread (p) at whatever inclination of the flight. In this respect, the ratio $2a+p=62\div65$ cm is the one normally used, but there are also other formulae which correlate with the aforementioned quantities, and in any case it is not permitted to choose one of the two measurements

independently of the other since this would be to the detriment of the ergonomics and practicability of a staircase.

Since the optimisation of the practicability of a staircase through the correct relationship between rise and tread is considered indispensable also for so-called modular staircases, the present invention concerns particular series modular supports whose fastening in succession, according to the predetermined rise and orientation, takes place subject to setting of the most suitable tread. Indeed, these are supports which, each provided with two parallel staggered cylindrical sleeves of a suitable diameter for the successive couplings along vertical pivot axes, at which the rises and the progression of the flights are to be defined, are made up of two mutually connected elements so as to allow, upon installation, the adjustment of the distance between the centres of the aforementioned two sleeves according to the chosen tread.

All of this is more clearly described hereafter with the aid of eight drawing tables where, for indicating and not limiting purposes, there are represented:

- figs. 1 and 2 which show, isometrically, a three-quarters view and the longitudinal section of the subject modular support according to a first embodiment;

- figs. 3 and 4 which show a top view and the vertical section of the modular support according to figs. 1 and 2;

- figs. 5 and 6 which show a top view and the vertical section of a second embodiment of the subject modular support;

- figs. 7 and 8 which show a top view and the vertical section of a third embodiment of the subject modular support;

- figs. 9 and 10 which show a top view and the vertical section of a fourth embodiment of the subject modular support;

- figs. 11 and 12 which show a top view and the vertical section of a fifth embodiment of the subject modular support;

- figs. 13 and 14 which show a top view and the vertical section of a sixth embodiment of the subject modular support;

- figs. 15 and 16 which show a side view and the bottom view of a seventh embodiment of the subject modular support;

- figs. 17 and 18 which show a side view and the bottom view of an eighth embodiment of the subject modular support;

- fig. 19 which shows the vertical section of the assembly in succession of two modular supports according to figs. 3 and 4;

- fig. 20 which shows the vertical section of the assembly in succession of two modular supports according to figs. 7 and 8;

- figs. 21, 22 and 23 which, through the longitudinal section of the cylindrical sleeves of two consecutive supports to be constrained to one another with simple pressure screws, show as many possible ways to avoid the possible slender thickness of said sleeves and in particular of the outer sleeve.

From a first quick review of all of the examples shown, it can be seen that from the cylindrical sleeves of the two elements which make up the modular support, special arms extend which, besides being shaped and sized to allow them to be inserted longitudinally inside each other, are also

arranged to allow them to be constrained to one another after the adjustment of the distance between the centres of the aforementioned sleeves according to the chosen tread.

Such arms, indeed, have a virtually rectangular section or at least such as to have at least two parallel faces which can be perpendicularly passed through by one or more screw locking means for obtaining the locking of the two support elements thanks also to the fact that two parallel faces of the outer arm, those perpendicular to the faces passed through by the one or more screw locking means, both have a longitudinal middle interruption of such a width and length as to allow the aforementioned outer arm the necessary elastic yield to clamp and block the arm inserted in it.

Obviously, to allow the insertion of the screw locking means and also the telescopic adjustment of the distance between the centres of the cylindrical sleeves according to the chosen tread, the two arms are suitably bored in the faces to be passed through with the screw locking means. In particular, as the attached drawings show, it is sufficient that near the end of the outer arm there are two vertically aligned holes at which the slot or the holes made in the two faces of the inner arm parallel to the first ones are to be arranged, adjusting the tread.

Finally, the two arms to be inserted longitudinally into each other, besides being perpendicular to the respective cylindrical sleeves so that the adjustment of the treads has no influence upon the rises, are sized and arranged so that the inner arm, upon maximum insertion in the outer one, can extend beyond the axis of the sleeve to which the outer arm is welded.

Analogously to what can be found in the already known modular supports for modular staircases, also the subject support, in particular the front element of all of the possible embodiments thereof, has one or more flat,

horizontal and co-planar portions, on which the tread plane of each stair is to be set and fastened, through screws inserted from below and through suitable holes.

Moreover, similarly to known embodiments, also for those made possible by the subject invention, it is foreseen that at the start and at the end of a flight there are supports which partially differ from the intermediate ones since they are suitable to be fastened one to the floor and the other to the wall or to a ceiling.

For the understandable need for briefness, the attached drawings only show the intermediate modular supports of the different example embodiments chosen to illustrate the validity and versatility of the present invention.

Before passing on to the description of the invention with reference to the attached drawings it is worth saying that, in such drawings, each of the two elements which make up a modular support is globally indicated with a letter of the alphabet followed by a reference numeral when it is necessary to indicate parts or details of the same element.

Examining the first example of a modular support that can be made according to the invention, the one represented in figs. 1-2-3-4-19, it is noted that it is made up of two elements A and B each formed from a cylindrical sleeve (A1 and B1) and an arm (A2 and B2) which, perpendicular to the sleeve, has a virtually rectangular section and is oriented so as to have two faces perpendicular, and two faces parallel, to the axis of the aforementioned sleeve.

Said arms, sized for the insertion of A2 in B2, are also arranged, in the faces perpendicular to the axes of the respective sleeves A1 and B1, to allow them to be constrained to one another after the telescopic adjustment of the distance between the centres of the sleeves according to the chosen tread, with the screw locking member T passing through the aforementioned arms parallel

to the sleeves.

Whilst the inner arm A2 is welded to the outside of the sleeve A1, the outer arm B2, besides having, in the two vertical faces, a longitudinal middle interruption B3 which allows it to elastically comply with the clamping member T in locking the inner arm A2, penetrates into the sleeve B1 to which it is welded thus allowing, the space taken up being equal, a wider adjustment of the tread, and greater structural rigidity.

Finally, the sleeve A1 of the front element A, from the top of which the flat portion A3 on which the tread plane Z is to be set and fastened is perpendicularly cantilevered, has two or more threaded holes A4 for the pressure screws V with which the outer sleeve A1 and inner sleeve B1 of two consecutive supports are to be constrained after adjustment of the selected rise and mutual orientation.

The support C-D of figs. 5 and 6 differs from the previous support A-B only because the arms C2 and D2, which extend from the respective sleeves C1 and D1, are arranged so that the screw locking member T, in this case horizontal, acts upon the faces parallel to the axes of the aforementioned sleeves since the necessary elastic yield for the locking of the inner arm C2 is ensured by the longitudinal middle interruption D3 provided in the two faces of the arm D2 perpendicular to the axes of the two sleeves and parallel to the locking member T.

Unlike the previous versions A-B and C-D, the support E-F of figs. 7-8-20 has the outer arm E2 which penetrates into the sleeve E1, from the top of which the flat portion E3 on which the tread plane Z is to be set and fastened with screws is perpendicularly cantilevered.

Therefore, it is such an outer arm E2 that has, in the two faces parallel to the axis of the sleeves, a longitudinal middle interruption E4 suitable for allowing the necessary

elastic yield for the locking of the inner arm F2 by the locking member T, in the case in question passing through the aforementioned arms E and F parallel to the sleeves. Moreover, it is the sleeve F1 of the rear element F that has the two or more threaded holes F3 for the pressure screws V with which the outer sleeve F1 and inner sleeve E1 of two consecutive supports are constrained after adjustment of the selected height and orientation.

The support G-H of figs. 9-10 differs from the previous support E-F only because the arms G2 and H2, which extend from the respective sleeves G1 and H1, are arranged so that the screw locking member T, in this case horizontal, acts upon the faces parallel to the axes of the aforementioned sleeves since the necessary elastic yield for the locking of the inner arm H2 is ensured by the longitudinal middle interruption G3 provided in the two faces of the arm G2 perpendicular to the axes of the two sleeves and parallel to the locking member T.

The support L-M of figures 11-12 is comparable with the support A-B of figs. 1-2-3-4-19 from which it differs in that, whereas the inner horizontal arm L2 is welded against the cylindrical surface of the vertical sleeve L1 from which it extends, the outer horizontal arm M2 is welded against the lower horizontal base of its sleeve M1 to offer, the space taken up being equal, a wider adjustment of the tread and greater structural rigidity of the whole group. In the case in question, the screw locking member T is parallel to the axis of the sleeves and the longitudinal middle interruption M3 is provided in the two vertical walls of the outer arm M2, those parallel to the aforementioned member T.

The support N-O of figs. 13-14 differs from the previous support L-M only because the arms N2 and O2, which extend from the respective sleeves N1 and O1, are arranged so that the screw locking member T, in this case horizontal, acts

upon the faces parallel to the axes of the aforementioned sleeves since the necessary elastic yield for the locking of the inner arm N2 is ensured by the longitudinal middle interruption O3 arranged in the two faces of the arm O2 perpendicular to the axes of the two sleeves and parallel to the locking member T.

The support P-Q of figures 15-16 is similar to the support E-F of figs. 7-8-20 from which it differs in that, whereas the inner horizontal arm Q2 is welded against the cylindrical surface of the vertical sleeve Q1 from which it extends, the outer horizontal arm P2 is welded against the upper horizontal base of its sleeve P1 to offer, the space take up being equal, a wider adjustment of the tread and greater structural rigidity of the whole group. In the case in question, the screw locking member T is parallel to the axis of the sleeves and the longitudinal middle interruption P3 is provided in the two vertical walls of the outer arm P2, those parallel to the aforementioned member T. In these same vertical walls the bored inserts P4, constituting the flat portions on which the tread plane Z is to be set and fastened with screws, are cantilevered applied.

The support R-S of figs. 17-18 differs from the previous support P-Q only because the arms R2 and S2, which extend from the respective sleeves R1 and S1, are arranged so that the screw locking member T, in this case horizontal, acts upon the faces parallel to the axes of the aforementioned sleeves since the necessary elastic yield for the locking of the inner arm S2 is ensured by the longitudinal middle interruption R3 provided in the two faces of the arm R2 which, perpendicular to the axes of the two sleeves and parallel to the locking member T, are the same ones from which the bored inserts R4, constituting the flat portions on which the tread plane Z is to be set and fastened with screws, project.

Although the supports represented and described are all provided with two parallel cylindrical sleeves with which to carry out the successive couplings along vertical pivot axes, within the present invention it is also foreseen that, in the same supports and in others deriving from them, the two cylindrical sleeves can be replaced by as many analogously sized and arranged prismatic tubes since their function is analogous.

Such supports are preferable, above all because they are easier to be positioned in operation, when making staircases with rectilinear flights or staircases which have in plan view, between one stair and the other, an angle that is equal or multiple with respect to that existing between one face and the next of the prismatic tube, in the case in question having a regular polygon section.

Relative to the mutual fastening of the cylindrical sleeves or of the prismatic tubes of two consecutive supports through two or more pressure screws, when the thickness of the outer element allows it, said screws pass through it in simple threaded holes that are suitably provided.

On the other hand, should the thickness of the outer element not be sufficient to ensure the grip of the screws in simple threaded holes, some possible remedies are represented in table 8.

According to the solution of fig. 21, where the pressure screws V must constrain to one another the outer element 1 and the inner element 2, said screws are screwed into the threaded seats arranged inside small collars 1' formed by drawing in the outer element 1.

According to the solution of fig. 22, where the pressure screws V must constrain to one another the outer element 3 and the inner element 5, said screws are screwed into threaded bushes or nuts 4 held in suitable bored seats 3'

formed from the outer element 3 through drawing.

According to the solution of Fig. 23, the pressure screws V are screwed into special threaded bushes 7 inserted in suitable holes of the outer element 6 and held inside it by small retention collars thereof, having the same thickness as the centring jacket 8 which, placed between the outer element 6 and the inner element 9, is bored at the small retention collars of the aforementioned threaded bushes 7.